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REGULAR PAPER

A prediction-based model for virtual machine live migration monitoring in a cloud datacenter

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Abstract

Live migration of virtual machines proves to be inexorable in providing load balancing among physical devices and allowing scalability and flexibility in resource allocation. The existing approaches exhibit different policies, distinct performance characteristics, and side effects such as power consumption and performance degradation. Therefore, determining the most optimal live migration algorithm in certain situations remains an open challenge. In this work, a new prediction-based model to manage the live migration process of VMs is introduced. Our adaptive model dynamically identifies the optimal live migration algorithm for a given performance metric based on a prior diagnosis of the system. The model is developed by considering the assumption of different workloads alongside certain resource constraints for any of the currently available migration algorithms. The proposed model consists of an ensemble-learning strategy that involves linear and non-parametric regression methods to predict six live migration key metrics, provided by the operator and/or the user, for each live migration algorithm. Our model allows considering the best combination which is constituted of the algorithm-metric pair to migrate a VM. The experimental results show that the proposed model allows to significantly alleviate the service level agreement violation rate by between 31% and 60%, along with decreasing the total CPU time required for the prediction process.

Keywords Datacenter · Virtual machine · Live migration · Performance metrics · Machine learning

Mathematics Subject Classification 62G08

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